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ABSTRACT

Since 1990 the author has designed and led staff development activities for 12 Australian schools in which every child is asked to own a notebook computer. Workshops are designed to inspire teachers to lead each other in the transition from traditional methodology to universal personal computing. This paper provides a case study of a school in Melbourne (Australia) which embarked on such a transition in 1989, where the computer became an intellectual laboratory and vehicle for self-expression. Staff development strategies which have attempted to bolster teacher confidence and accommodate individual teacher learning styles are: in-classroom collaborations among teachers; 3-day "slumber parties" featuring extended periods of project brainstorming; and building a book on the personal computer. General suggestions for success in similar situations are listed, including off-site institutes and in-school sabbaticals. (Contains 10 references.) (Author/BEW)

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A Constructive Approach to Staff Development and Educational Change

by Gary S. Stager

Paper presented at the NECC '95, the Annual National Educational Computing Conference (16th, Baltimore, MD, June 17-19, 1995.

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A Constructive Approach to Staff Development and Educational Change

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Abstract

Little research exists to guide staff development in schools in which every child has a notebook computer. Since 1990, I have designed and led staff development activities for twelve such Australian schools. The work focused on inspiring teachers to lead each other in the transition from traditional methodology to universal computing. This paper is intended to motivate others to replicate and expand upon the ideas discussed within.

> *"We start from the assumption that good schools are unique. In order to be good, a school has to reflect its own community. And therefore, we offer no model. There's nothing that you just "put into place," nothing to "implement." Our research suggests that you're not going to get significant, long-term reform unless you have a subtle but powerful support and collaboration among teachers, students and the families..."*
>
> Ted Sizer, *Educational Leadership* interview. February 1995.

A CASE STUDY

In 1989, Methodist Ladies' College (MLC) in Melbourne, Australia embarked on a learning adventure still unparalleled around the world. At that time the school made a commitment to personal computing, Logo, and constructionism. The governing principle was that every child in the school (grades 5-12) would own a personal notebook computer to use anywhere and across the curriculum. Their ideas and work would be stored and manipulated on their own computer. Ownership of the notebook computer would reinforce ownership of the knowledge constructed with it. The personal computer is a vehicle for building something tangible outside of your head - one of the tenets of constructionism. By 1994, 2,000 teachers and students had a personal notebook computer.

Personal computing in schools not only challenges the status quo of computers in schools, but creates profound opportunities for the teaching staff. Schools often take computers too seriously by hiring special computer teachers and scheduling times at which students may use a computer, that they trivialize their potential as personal objects to think with. Computers are ubiquitous and personal throughout society, just not in schools.

The challenge of getting 150 teachers to embrace not only the technology, but the classroom change that would accompany widespread and continuous LogoWriter use is enormous. Thus far the school's efforts have paid off in a more positive approach to the art of learning on the part of students and teachers.

A Critical Choice

The laptop initiative inspired by Liddy Nevile and MLC Principal, David Loader, was never viewed as a traditional educational research experiment where neither success or failure mattered much. Personal computing was part of the school's commitment to creating a nurturing learning culture. Steps were taken to ensure that teachers were supported in their own learning by catering to a wide range of learning styles, experiences, and interests. It was agreed that personal computing was a powerful idea more important than the computers themselves. What was done with the computers was of paramount importance. LogoWriter was MLC's primary software of choice. (MicroWorlds recently replaced LogoWriter)

Although educational change is considered to occur at a geologically slow pace, the MLC community (parents, teachers, students, administrators) has evolved impressively in just a few short years. The introduction of large numbers of personal computers has served as one catalyst for this "intellectual growth spurt." MLC teachers routinely engage each other in thoughtful discussions of learning, teaching, and the nature of school. While similar conversations undoubtedly occurred prior to the introduction of personal computing, today's discussions are enriched by personal learning experience and reflections on the learning of their students in this computer-rich environment. Traditional curricula, pedagogy, and assessment are constantly being challenged. One teacher even suggested that mathematics no longer be taught. Such an idea would have been unthinkable in a conservative church school ten years ago.

Schools routinely spend a fortune building fortresses, called computer labs complete with special furniture.[1] The personal computing experience at MLC has been different. In less than four years, 1600 children and teachers had personal computers and approximately 40 teachers in one school had made LogoWriter part of their repertoire. Given the changes, identified by the teachers themselves[2][1], that have accompanied classroom computer use, this initiative would have been cheap at twice the price.

Challenging Our Notions of School

The act of asking every parent to purchase a notebook computer for their child[3] was not nearly as courageous or challenging as the way in which MLC has chosen to use computers. MLC chose to guide its thinking about personal computing by the ideas of "constructionism" and by viewing the computer as "material." Constructionism is the idea of Jean Piaget and extended by Seymour Papert to mean that learning is active and occurs when an individual finds herself in a meaningful context for making connections between fragments of knowledge, the present situation, and past experiences. The person constructs her own knowledge by assembling personally significant mental models. Therefore you learn in a vibrant social context in which individuals have the opportunity to share ideas, collaborate, make things, and have meaningful experiences. After the first year of using laptops, the seventh and eighth grade humanities teachers asked for history, English, geography, and religious education to be taught in an interdisciplinary three-period block. This scheduling modification allowed for students to engage in substantive projects.

The computer as material metaphor contends that children and teachers are naturally talented at making things. The computer is seen as an intellectual laboratory and vehicle for self-expression - an integral part of the learning process. In this

context, a gifted computer-using teacher is not one who can recite a reference manual, but one who can heat-up a body of content when it comes in contact with the interests and experiences of the child. This teacher recognizes when it might be appropriate to involve the computer in the learning process and allows the student to mold this personal computer space into a personal expression of the subject matter.

Staff Development

While every teacher is expected to use technology in appropriate ways, their learning styles are respected and catered for via a range of professional learning opportunities. In-classroom consultants such as myself, visiting experts, conference participation, peer collaboration, university courses, courses offered by the school's community education department, and residential whole-learning experiences all accompany the common after-school workshop. MLC recognizes two outstanding LogoWriter-using teachers by reducing their number of classes and asking them to assist other teachers in their classrooms. It is common for one teacher interested in sharing a recent insight to voluntarily offer a workshop for colleagues. Teachers have stated that sharing ideas with colleagues and the residential events have been their most rewarding staff development experiences.

Teachers at MLC were introduced to computers by being challenged to reflect on their own learning while solving problems of personal significance in the software environment, LogoWriter - the software the students would be using. I would argue that educational progress occurs when a teacher is able to see how the particular innovation benefits a group of learners. These teachers come to respect the learning processes of their students by experiencing the same sort of challenges and joy. The teacher and learner in such a culture are often one-and-the-same. Other teachers find the enthusiasm and pride of their colleagues infectious. MLC is using LogoWriter to help free the learner to express herself in unlimited ways - not bound by the limits of the curriculum or artificial (school) boundaries between subject areas.

Students at MLC have used LogoWriter across the curriculum in numerous and varied ways. A student designing a hieroglyphic word processor, a longitudinal rain data grapher, or Olympic games simulation must come in contact with many mathematical concepts including randomness, decimals, percent, sequencing, Cartesian coordinate geometry, functions, visual representations of data, linear measurement, and orientation, while focusing on a history topic. An aspect of ancient Egyptian civilization was brought to life by first drawing Egyptian urns and then designing pots that portrayed contemporary Australian life. Their teacher remarked at how traditional pencil and paper artistic skills no longer created an inequity in personal expression. A sixth grade girl was free to explore the concept of orbiting planets by designing a visual race between the planets on the screen. The more the student projects blur the distinctions between subject areas, the more the curriculum is rethought. Fantastic examples of student work abound.

STAFF DEVELOPMENT INNOVATIONS

Many schools find the task of getting a handful of teachers to use computers at even a superficial level daunting. MLC expects their teachers to not only be comfortable with thirty notebook computers in their classroom, but to participate actively in the reinvention of their school. In such progressive schools staff development is no longer a technical act of pouring information into a teacher's head or training them in a few technical skills. Staff development should help teachers fearlessly dream, explore, and invent new educational experiences for their students. Staff development experiences must embody powerful ideas and provide teachers with the opportunity to discover the learner inside and to fall in love with learning. Such a teacher will also love teaching.

I have been fortunate to use the following three staff development strategies at MLC and schools inspired by its example.

• In-classroom Collaboration

Several Australian "laptop schools" have used the in-classroom approach to staff development I developed working in the Scarsdale, NY and Wayne, NJ public schools. This collaborative form of teacher development places the "trainer" in the teacher's classroom to observe, evaluate, answer questions and model imaginative ways in which the technology may be used by the learners. The collaborative spirit and enthusiasm engendered by the "trainer" motivates the classroom teacher who feels more comfortable taking risks when a colleague is there to help. Since this professional development occurs on the teacher's turf implementation seems more viable. The fact that it occurs during school hours goes a long way towards eliminating teacher objections.

Two more unique staff development formats I developed at MLC are worthy of a more detailed discussion. Both model constructionism by providing meaningful contexts for learning, an emphasis on collaborative problem solving and personal expression, and by placing the learner (in this case teachers) at the center of their learning experiences. Each values and respects the professionalism of the teacher by acknowledging the knowledge, skills, and experience they each possess. Hopefully teachers recognize the respect afforded them so the idea that "kids know stuff" will become a basic element of their teaching.

• Residential Logo "Slumber Parties"

Without first-hand experience, constructionism, child-centered learning, and collaborative problem solving are abstract to teachers. The promise of such learning environments will never be realized. How can we expect teachers to teach in ways they never experienced as learners or were trained to employ as teachers? How could teachers create environments nurturing collaboration and construction of knowledge when the teacher has never seen such a classroom environment?

Armed with this observation I asked the school principal to organize a residential Logo "slumber party." The residential aspect of these workshops is critical to creating the desired hot house of learning. As the "Head Counselor" I was able to draw

upon my own learning experiences gained from years of participation in Dan and Molly Lynn Watt's Summer Logo Institutes.

Teachers leave the pressures of school and home behind for three days to improve their computing skills in a carefully constructed environment designed to foster opportunities for peer collaboration, self expression, personal reflection and a renewed enthusiasm for learning. Most teachers believe that learning occurs best in a social context. These learner-centered "workshops" stress action, not rhetoric. The workshop leader serves as a catalyst for collaboration and creates opportunities for personal reflection and connecting such "learning stories" to teaching.

The residential experiences model constructionism by allowing teachers to learn in an environment that values collaboration between colleagues of differing backgrounds and opportunities to appreciate the learning styles of others. The emphasis is on doing. The teacher's excitement naturally leads to informal discussions of teaching and classroom transformation. These connections are powerful when they come from the teacher's own experience - much like the types of learning opportunities we desire for students.

The following is a sample schedule of the slumber party developed at MLC and replicated at several other schools.

Slumber Party Format

Project Brainstorming

Before we are even sure that every teacher can turn on the computer we ask them to identify LogoWriter projects they wish to work on for the next three days. The projects may be collaborative or personal - curriculum-related or having nothing to do with the subject they teach. This brainstorming session assures teachers that they will be able to change their minds, but stresses that they must "get busy."

First, I ask for project ideas and write them on the whiteboard. Second I ask, "Who wants to work on this project?" People may put their name next to as many projects as interest them. We then go for a snack to clear our minds and informally discuss the ideas with colleagues. After the intermission, participants realize that there are too many projects for the number of participants. They almost immediately start combining similar projects and rejecting others. I make such connections and deletions on the whiteboard. Finally, I ask for a volunteer to be the "beacon" of the group. This is the person that marks the place for the group form and has no leadership responsibilies.

Many of the projects are certain to change and people will go in and out of different groups. However, the brainstorming provides a strong springboard for getting started.

Powerful Ideas

Each day begins with a discussion of a related education issue and often a philosophical discussion. Such topics might include: The history of Logo and your role in technological innovation (what the school has already accomplished); Process approaches to learning or share a personally profound learning story. The final day's topic, "What does this have to do with school?" seeks to have teachers reflect on their recent learning experiences and make connections to their role as teachers.

Problem Solving Off the Deep End

One or two problem solving activities of a two or three hour duration are organized to demonstrate how complex open-ended problems may be solved via collaboration and the sharing of expertise. Teams of teachers may explore an experimental mathematics problem; draw a LEGO TC logo invention at random (build and program an ATM machine that dispenses $1 and $5 bills, build and program a coin operated bartender that pours drinks and only accepts quarters, design a working LEGO clock; or competitive challenges such as, build, program, and control a LEGO machine to place poker chips in the opposing team's goal in under two minutes.

These experiences often result in an awareness that not every problem has one correct answer or is even solvable. The teachers gain an appreciation for how much can be learned through such a problem solving process and how these activities usually require more than 45 minutes of class time.

Such "slumber parties" are organized on a regular basis in an attempt to enlarge the pool of teachers comfortable with similar learning philosophies. Since the primary goal of the workshop is to support a learning community, teachers and administrators are encouraged to participate in these workshops more than once. Participants in these workshops also gain appreciation for the power and expressive potential of LogoWriter. They are reminded that their colleagues are creative, imaginative learners like themselves. Math teachers are often surprised to see their English teacher counterparts explore complex mathematical relationships while math teachers explore French or geography.

This model of professional development has been replicated on several occasions at MLC and several other schools. The teachers' own assessment of learning outcomes derived at the "Logo slumber parties" makes the cost of sending fifteen teachers to the Hilton for three days inexpensive when compared with the cost of a never-ending series of two-hour after-school workshops from here to eternity.

• Build a Book Programming Residential Workshops

The teachers found that kids could go a lot with a little Logo, but expressed a need to learn more formal programming techniques. I was concerned with finding a format that would enhance the teachers' programming fluency without lecturing and traditional instructionist computer science pedagogy.

My solution to this challenge was inspired by Chip Healy's book, *Build a Book Geometry*. The book chronicles Chip's

experience as a high school geometry teacher who spends the entire year encouraging his students to write their own geometry text through discovery, discussion, debate, and experimentation. The book provides an exciting model for taking what teams of students know and can articulate about a concept and then giving them challenges built upon their understanding or misunderstanding. The responses are then used to elicit a set of issues to be responded to by another team and so on. Throughout this process each team is encouraged to keep careful notes of hypotheses, process, and conclusions and to share these notes with the other teams during the process of writing the class book. I sensed that this wonderful approach to constructionism could be used to "teach" complex programming issues in two days.

Healy's ideas inspired a format that addressed the areas of confusion and needs of each teacher through collaboration, discussion, problem solving, and journal writing. Before the two-day residential workshop I asked each participant to identify three LogoWriter programming issues that they did not understand or needed clarification. I then assembled the teachers into three teams of varying ability, subject, and grade levels.

When the teachers arrived at the workshop they were placed in their groups and handed four questions to which they were asked to solve - to the best of their ability. The questions were split between ones requiring definition and others application. Care was taken to ensure that a team containing the author of a question was not given that question. Teams were allowed to trade one question each with another group if they were unable to solve a particular problem. No group did.

The three groups spent over four hours each answering the questions and explaining numerous programming (and often mathematical issues) to each other. This exercise stressed the most important component of cooperative learning, interdependence.

The teams were asked to keep careful notes of their programming processes, questions, and discoveries - in addition to answers to the problems. These collective notes would be included in the class book. A LogoWriter page containing complicated tool procedures were available. Each group eventually found ways to use some of the tools in their problem solving. They even annotated the tools for later use.

When each group had answered all four questions to their collective satisfaction, each teacher met with a member of another team and explained what each team accomplished. The peer teaching took a substnatial period of time.

Emerging questions were then explored through projects, designed by the leader, that would utilize their increasingly sophisticated skills. We were able to deal with issues of programming elegance by simplifying strategies commonly employed by teachers and students. Seemingly complex issues associated with multiple turtles, recursion, list processing global vs. local procedures, data representaion and inputs became clear.

Teams were asked every few hours to collect individual notes in a team file. Two hours at the end of the workshop were devoted to assembling each team's notes on one disk. This disk was viewed as a powerful "personal" reference source the teachers could use back in their classrooms. The amount of learning that was achieved in two days and the enthusiasm of the participants is evidence of this approach to is evidence of the efficacy to this approach to teacher development. This approach to learning, be it in a classroom or staff development workshop, is economical in both dollars and time when you consider the return on the investment. Schools routinely spend a lot more time teaching concepts in bite-size chunks while leaving real learning to chance.

SUGGESTIONS FOR SUCCESS

• **Work With the Living** Schools have limited technological and teacher development resources and they should be allocated prudently. Good teachers who have yet to recognize how computer technology may enhance their teaching are not evil. If a school focuses its energy and resources on creating a few successful models of classroom computing each year, the enthusiasm among teachers will be infectious. When fifteen teachers in a school or district joyfully use technology more teachers are likely to find a comfortable path towards implementation. The most recalcitrant of teachers will recognize that they are in the minority. A selection of models must be offered to teachers of differing backgrounds and subject areas. The school should be cautious not to create negative models of computing use.

• **Stay on Message** School administrators need to articulate (and believe) a very clear philosophy regarding how the new technology is to be used and how the culture of the school is likely to change. Communication between teachers and their administrators has to be honest, safe, and comfortable. Administrators need to constantly clarify the curricular content and traditions the school values, as well as, the outdated methodology and content that may be eliminated. Teachers need to trust their administrators to support them through these transitional periods.

• **Work On Teachers' Turf** Those responsible for staff development should be skilled in classroom implementation and work along-side the teacher in her classroom to create models of constructive computer use. It is important for teachers to see what students are capable of and this is difficult to do in brief workshop at the end of a long work day.

• **Off-site Institutes** Schools must ensure that teachers not only understand the concepts of collaborative problem solving, cooperative learning, and constructionism - they must be given the opportunity to leave behind the pressures of family and school for several days in order to actually reexperience the art of learning with their colleagues. Off-site residential "whole learning" workshops can have a profoundly positive effect on a large number of teachers in a short period of time.

• **Provide Adequate Support** Nothing dooms the use of technology in the classroom quicker than not supporting the teacher who worked hard to develop new skills. Be sure that the school does everything humanly possible to support the teacher's efforts by providing the technology requested, maintaining it, and by providing access to a working printer and a supply of blank disks.

• **Practice What You Preach** Staff development experiences should be engaging, interdisciplinary, collaborative, hetero-

geneous, and models of constructionist learning.

• **Share Learning Stories** Teachers should be encouraged to reflect on significant personal learning experiences from their lives and the staff development experience. They should share these experiences with their colleagues and discuss the relationship between their own learning and their classroom practices.

• **Celebrate Initiative** Teachers who have made a demonstrative commitment to educational computing should be recognized by being freed of some duties in order to assist colleagues in their classrooms, encouraged to lead workshops, and given access to additional hardware.

• **In-School Sabbaticals** Innovative teachers should be provided with the school time and resources necessary to develop curricula and conduct action research in her/his school.

• **Assist Teacher Purchases of Technology** Schools should help fund 50-80% of a teacher's purchase of a personal computer for use in school and home. This act demonstrates to teachers a shared committment to educational progress. Partial funding gives teachers the flexibility to purchase the right personal computer configuration. The school may offer an annual stipend for upgrades and peripherals.

• **Make Abundant Technology Available** A teacher in a school with hundreds of computers quickly recognizes that the school values classroom computing. Teachers become quickly frustrated by not having access to appropriate technology when and where it is needed.

• **Cast a Wide Net** No one method of staff development works for all teachers. A combination of traditional workshops, in-classroom collaborations, mentoring, conference participation, and whole learning residential workshops must be available for teachers to choose from at their own pace. Teachers should be made to feel comfortable growing at their own rate. Therefore, a variety of staff development options may need to be offered regularly.

• **Avoid Software DuJour** The people responsible for paying for school computing are made to feel guilty by the media and other administrators if they do not constantly do something "new" with their computers. Unfortunately newness is equated with lots of software. It is reckless and expensive to jump on every software bandwagon. Using narrow skill-specific software has little benefit to students and undermines staff comfort with computing. Choose an open-ended environment, such as MicroWorlds, in which students express themselves in many ways that may also converge with the curriculum.

• **Never Satisfied - Only Gratified** Staff development must always be dedicated to continuing educational excellence.

Although most US schools can dream of only a handful of computers, the reality of what is happening in schools all over Australia requires serious consideration. Professional teacher development must accept the eventuality of universal computing in order for schools to have a relevant future. If we desire to restructure schools then we must recognize that the only constant we can depend on is teachers. Our schools will only be as good as the least professional teacher. Staff development must enhance that professionalism and empower teachers to improve the lives of their students. Our children deserve no less.

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[1] Grasso, I. (1993), *Reflections of a Learning Community*. Melbourne, Australia: MLC.

[2] Each MLC teacher interested in owning a personal notebook computer receives a substantial subsidy from the school towards the purchase of a computer. The school decided against fully funding the computer for two reasons. 1) The teacher had flexibility to purchase the computer that met his/her specific needs and 2) Teachers were being asked to make a personal commitment to personal computing. Each year a $400-$700 stipend has been available to teachers interested in upgrading their hardware or purchasing peripherals.